

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently amended) A ~~[[R]]~~robot system including at least one mobile robot ~~[[(10)]]~~, for treating a surface, comprising which comprises:
map storage logic ~~[[means]]~~ to store a map of the surface to be treated ~~[[and]]~~;
a navigator ~~[[means]]~~ to navigate the, ~~or each,~~ mobile robot ~~[[(10)]]~~ to at least one point on a surface; ~~characterized in that the, or each, mobile robot (10) comprises and~~
wherein the mobile robot is configured to:
~~locating means (13,14) to~~ identify its position with respect to the surface to be treated~~[[,]]~~;
~~means to~~ automatically deviate the mobile robot away from its initial path in the event that an obstacle is detected along its path~~[[,]]~~;
~~means to~~ store and/or communicate data concerning the surface treatment performed and any obstacles detected by the sensor ~~locating means (13,14);~~ ~~[[and]]~~
~~emitting means (15) that produce emissions (17) such as, the emissions~~
comprising symbols, lines, shapes, or written characters in one or more colours for treating at least one point on a surface; and
return to an area in which an obstacle was detected after a pre-determined time to check whether the obstacle is still present and whether the mobile robot or another mobile is still hindered from performing surface treatment in that area.
2. (Currently Amended) The ~~[[R]]~~robot system ~~according to of~~ claim 1, ~~characterized in that~~ wherein said ~~emitting means (15) are arranged to dispense emissions~~ comprise at least one of the following:
ink, paint, glue, a gas, a liquid, a powder or light to mark, etch, decorate or chemically react with the surface to be treated.

3. (Currently amended) ~~The [[R]]robot system according to~~ of claim 2,
~~characterized in that wherein the, or each, mobile robot [(10)] or another mobile robot~~
~~comprises~~ is configured to:

~~an on-board computer (12) including map storage means~~ store a map; and
~~means to store and/or communicate data concerning the surface treatment performed and~~
~~any obstacles detected by the locating means (13,14).~~

4. (Cancelled)

5. (Currently amended) ~~The [[R]]robot system according to~~ of claim 3 ~~[[4]],~~
~~characterized in that the locating means (13,14) comprise~~ wherein the mobile robot is configured
to identify its position via at least one of the following types of sensor~~[[;]]~~:

~~optical such as a, laser~~ optical, thermal imaging, electro-magnetic, sonar, GPS, pressure,
motion, angle detection, contact or direction sensors.

6. (Currently amended) ~~The [[R]]robot system according to~~ of claim 5,
~~characterized in that it comprises~~ further comprising:

a differentiator ~~[[means]]~~ to differentiate between different objects or different parts of
the same object by detecting differences in the reflectivity of the different materials constituting
those objects.

7. (Currently amended) ~~The [[R]]robot system according to~~ of claim 6,
~~characterized in that the, or each, mobile robot (10) comprises~~ wherein the mobile robot or
another mobile robot is configured to:

communicate via wired or wireless communication ~~means such as, the wired or wireless~~
communications comprising: an electric or optic cable, an antenna or ~~Bluetooth~~TM wireless
hardware to communicate with a remote user, control system or computer network or another
mobile robot.

8. (Currently amended) The [[R]] robot system according to of claim 7,
characterized in that the communication means are arranged to report wherein the mobile robot
or another mobile robot is configured to:

report that an obstacle has been encountered by ~~a mobile robot (10)~~ if the mobile robot or
another mobile robot when the obstacle has not been removed after a second pre-determined time
~~such as a few seconds.~~

9. (Currently amended) The [[R]] robot system according to of claim 8,
characterized in that the, or each, mobile robot (10) traverses wherein the mobile robot or
another mobile robot is configured to:

traverse the surface to be treated.

10. (Currently amended) The [[R]] robot system according to of claim 9,
characterized in that the, or each, mobile robot (10) traverses wherein the mobile robot or
another mobile robot is configured to:

traverse a surface other than the surface to be treated.

11. (Currently amended) The [[R]] robot system according to of claim 10,
characterized in that the, or each, mobile robot (10) wherein the mobile robot or another mobile
robot is configured to:

~~deletion means, instead of, or in addition to the emitting means (15), which are arranged~~
~~to remove emissions [[(17)]] produced by the emitting means (15) of by the same or another~~
mobile robot [[(10)]] in the same or a previous run respectively.

12. (Currently amended) A [[M]] method for treating a surface using a robot system
including at least one mobile robot [[(10)]], comprising:

inputting a map of a surface to be treated into a computer [[(12)]] located on-board or
remotely to the, or each, mobile robot [[(10)]] or another mobile robot: [[,]]

navigating the, ~~or each,~~ mobile robot or another mobile robot to at least one point on a surface[[,]];

~~characterized in that the, or each, mobile robot, (10) draws~~ drawing up, by the mobile robot or another mobile robot, a map of the surface using information collected from ~~on-board or a remote locator~~[[ing]] ~~means (13,14)~~ used to identify the position of the mobile robot with respect to the surface to be treated [[and]];

~~automatically deviates~~ deviating, by the mobile robot or another mobile robot, away from its initial path in the event that an obstacle is detected along its path[[,]];

~~that the, or each, mobile robot (10) stores and/or communicates~~ storing and/or communicating, by the mobile robot or another mobile robot, data concerning the surface treatment performed and the obstacles detected by the locator ~~locating means (13,14) and that;~~

producing emissions, by the mobile robot or another mobile robot, emissions (17) ~~such as, the emissions comprising~~ symbols, lines, shapes, or written characters in one or more colours ~~are produced by emitting means (15),~~ for treating at least one point on the surface[[.]]; and

returning, by the mobile robot or another mobile robot, to an area near the obstacle after a pre-determined time to check whether the obstacle is still present and whether it is therefore still hindered from performing surface treatment in that area.

13. (Currently Amended) The [[M]]method according to claim 12, ~~characterized in that further comprising:~~

receiving map data of the surface ~~and, if available, path data is inputted in the form of a file such as a file from a CAD-system.~~

14. (Cancelled)

15. (Currently amended) The [[M]]method according to claim 12 [[14]], ~~characterized in that the, or each,~~ further comprising:

instructing the mobile robot or another mobile robot to return mobile robot (10) is
~~instructed to return to areas~~ to an area in which an obstacle was identified after the obstacle has been removed.

16. (Currently amended) ~~The [[M]]~~method according to claim 15, characterized in
~~that wherein~~ one or more points or parts of a permanent structure having a complex geometry
and located in the working area of the, ~~or each~~ mobile robot ~~[(10)]~~ or another mobile robot is
marked with reflective material, ~~such as reflective tape,~~ to strengthen the signals reflected from
said points or parts to facilitate correspondence between data from the locator ~~locating means~~
and data from the robot system's map.

17. (Currently amended) A set of computer-readable storage media[[um]]
~~characterized in that it contains~~ for causing a robot system including at least one mobile robot to
treat a surface bearing instructions that, when executed on the system, cause the system to
perform operations comprising means for making a computer or processor carry out the method
according to claim 12:

inputting a map of a surface to be treated into a computer located on-board or remotely to
the mobile robot or another mobile robot;

navigating the mobile robot or another mobile robot to at least one point on a surface;

drawing up, by the mobile robot or another mobile robot, a map of the surface using
information collected from a locator used to identify the position of the mobile robot with respect
to the surface to be treated;

automatically deviating, by the mobile robot or another mobile robot, away from its
initial path in the event that an obstacle is detected along its path;

storing and/or communicating, by the mobile robot or another mobile robot, data
concerning the surface treatment performed and the obstacles detected by the locator;

producing emissions, by the mobile robot or another mobile robot, emissions, the
emissions comprising symbols, lines, shapes, or written characters in one or more colours, for
treating at least one point on the surface; and

returning, by the mobile robot or another mobile robot, to an area near the obstacle after a pre-determined time to check whether the obstacle is still present and whether it is therefore still hindered from performing surface treatment in that area.

18. (Cancelled)

19. (Currently amended) ~~[[A]]~~ The set of computer-readable storage media medium ~~according to~~ of claim 17, characterized in that it further comprises further bearing instructions that, when executed on the system, cause the system to perform operations comprising:
computer-executable instructions for the emitting means (15)-producing emissions used to treat the surface.

20. (Currently amended) ~~[[A]]~~ The set of computer-readable storage media medium ~~according to~~ of claim 17, characterized in that it further contains further comprising:
data stored thereon containing a map of [[a]] the surface and optionally a pre-programmed path to direct the, or each, mobile robot around that path.

21-23. (Cancelled)

24. (Currently amended) The [[R]]robot system according to ~~of claim 1,~~ characterized in that wherein the locator comprises locating means (13,14) comprise at least one of the following types of sensor[[:]]:
optical, such as a laser optical, thermal imaging, electro-magnetic, sonar, GPS, pressure, motion, angle detection, contact or direction sensors.

25. (Currently amended) The [[R]]robot system according to ~~of claim 1,~~ characterized in that it comprises further comprising:

a differentiator ~~[[means]]~~ to differentiate between different objects or different parts of the same object by detecting differences in the reflectivity of the different materials constituting those objects.

26. (Currently amended) ~~The [[R]]~~robot system ~~according to~~ of claim 1, ~~characterized in that the, or each,~~ wherein the mobile robot or another mobile robot is configured to:

communicate via ~~mobile robot (10) comprises~~ ~~wired or wireless communication means~~ ~~such as,~~ the wired or wireless communications comprising: an electric or optic cable, an antenna or Bluetooth™ wireless hardware to communicate with a remote user, control system or computer network or another robot.

27. (Currently amended) ~~The [[R]]~~robot system ~~according to~~ of claim 1, ~~characterized in that the communication means are arranged to report~~ wherein the mobile robot or another mobile robot is configured to:

~~means for reporting~~ report that an obstacle has been encountered ~~by a mobile robot (10) if~~ when the obstacle has not been removed after a second pre-determined time ~~such as a few~~ seconds.

28. (Currently amended) ~~The [[R]]~~robot system ~~according to~~ of claim 1, ~~characterized in that the, or each,~~ wherein the mobile robot or another mobile robot is configured to:

traverse ~~mobile robot (10) traverses~~ the surface to be treated.

29. (Currently amended) ~~The [[R]]~~robot system ~~according to~~ of claim 1, ~~characterized in that the, or each,~~ wherein the mobile robot or another mobile robot is configured to:

traverse ~~mobile robot (10) traverses~~ a surface other than the surface to be treated.

30. (Currently amended) ~~The [[R]]~~robot system ~~according to~~ of claim 1, characterized in that ~~the, or each, mobile robot (10) comprises~~ wherein the mobile robot or another mobile robot is configured to:

~~deletion means, instead of, or in addition to the emitting means (15), which are arranged to remove emissions [[(17)]] produced by the emitting means (15) of the same or another mobile robot [[(10)]] in the same or a previous run respectively.~~

31. (Currently amended) The robot system of claim 1, ~~wherein the at least one mobile robot is operative~~ the mobile robot or another mobile robot is configured to:

~~for indicating or marking~~ indicate or mark out a physical lay-out on any indoor or outdoor surface, the physical lay-out comprising: ~~such as at~~ an exhibition, a trade fair or construction site.

32. (Currently amended) The robot system of claim 1, ~~wherein the at least one mobile robot is operative~~ the mobile robot or another mobile robot is configured to:

~~for marking~~ mark out a physical lay-out at a site under hazardous or hygienic conditions.

33. (Cancelled)

34. (Currently amended) [[A]] ~~The method according to~~ of claim 12, ~~characterized in that the, or each, mobile robot (10) is instructed to return~~ further comprising:

returning to an area[[s]] in which an obstacle was identified after the obstacle has been removed.

35. (Currently amended) [[A]] ~~The method according to~~ of claim 12, ~~characterized in that~~ wherein one or more points or parts of a permanent structure having a complex geometry and located in the working area of the, ~~or each~~ mobile robot [[(10)]] is marked with reflective material, ~~such as reflective tape,~~ to strengthen the signals reflected from said points or parts to

facilitate correspondence between data from the locator ~~locating means~~ and data from the robot system's map.

36. (Currently amended) The method of claim 12, further comprising:
marking out a physical lay-out at a site under hazardous or hygienic conditions ~~by the at least one robot.~~

37. (Cancelled)

38. (New) The method of claim 13, further comprising:
receiving path data of the surface inputted in the form of a file from a CAD-system.

39. (New) The set of computer-readable storage media of claim 20, further comprising:
data stored thereon containing a pre-programmed path to direct the mobile robot around that path.

40. (New) A method for a mobile robot to treat a surface, comprising:
producing emissions along a path of the surface, the emissions comprising symbols, lines, shapes, or written characters in one or more colors for treating at least one point on a surface;
deviating away from the path in response to detecting an obstacle obstructing a first part of the path;
producing emissions along a second part of the path not obstructed by the obstacle; and
returning to an area near the obstacle after a pre-determined time, and in response to determining that the obstacle no longer obstructs the first part of the path, producing emissions along the first part of the path.

41. (New) The method of claim 40, wherein producing emissions comprises: producing one of an ink, a paint, a glue, a gas, a liquid, a powder or a light, to mark, etch, decorate or chemically react with the surface to be treated.

42. (New) The mobile robot of claim 41, further comprising:
storing a map;
determining that there is an obstacle at a first position on the map;
storing data indicative of the obstacle;
storing data indicative of the emissions produced at a second position on the map; and
communicating data indicative of the obstacle and the emissions produced.

43. (New) The method of claim 40, further comprising:
identifying a position with respect to the surface to be treated.

44. (New) The method of claim 43, wherein identifying a position comprises:
identifying the position based on the output of a sensor comprising: an optical sensor, a laser optical sensor, a thermal imaging sensor, a electro-magnetic sensor, a sonar sensor, a Global Positioning System (GPS) sensor, a pressure sensor, a motion sensor, an angle detection sensor, a contact sensor or a direction sensor.

45. (New) The method of claim 40, further comprising:
communicating with a remote computer via an electric cable, an optic cable, an antenna, or wireless hardware.

46. (New) The method of claim 45, wherein communicating with a remote computer comprises:

reporting that an obstacle has been encountered in response to determining that the obstacle has not been removed after a second pre-determined time.

47. (New) The method of claim 46, further comprising:
traversing the surface to be treated.
48. (New) The method of claim 47, further comprising:
traversing a surface other than the surface to be treated.
49. (New) The method of claim 40, further comprising:
removing emissions previously produced.
50. (New) The method of claim 40, further comprising:
differentiating between different parts of an area based on detecting differences in the
reflectivity of the different materials in the area.
51. (New) The method of claim 40, further comprising:
communicating with a remote computer via an electric cable, an optic cable, an antenna
or wireless hardware.
52. (New) The method of claim 40, further comprising:
reporting that an obstacle has been encountered in response to determining that the
obstacle has not been removed after a second pre-determined time.
53. (New) The method of claim 40, further comprising:
traversing the surface to be treated.
54. (New) The method of claim 40, further comprising:
traversing a surface other than the surface to be treated.
55. (New) The method of claim 40, further comprising:

indicating or marking out a physical lay-out on any indoor or outdoor surface, the physical lay-out comprising: an exhibition, a trade fair or construction site.

56. (New) The method of claim 40, further comprising:
marking out a physical lay-out at a site under hazardous or hygienic conditions.